

## Category 1 Streams

### Primary Kokanee Spawning Streams

- Ebright Creek
- Laughing Jacobs Creek
- Lewis Creek
- Pine Lake Creek

### Ebright Creek

#### Goal/Vision

The goal for Ebright Creek is to increase the number of kokanee spawning in Ebright Creek and greatly expand and improve the extent, connectivity, and stability of the stream habitat that kokanee can use to spawn.

Ebright Creek (WRIA #08.0149) is on the east side of Lake Sammamish and is located about 2,000 ft north of 8th Street off of the East Lake Sammamish Parkway in the City of Sammamish (Figure 4). Ebright Creek has two major culverts (East Lake Sammamish Trail and Parkway) that may impede fish passage under some flow conditions (Table 1). Stream segments upstream of these culverts are in need of stabilization and/or habitat restoration.

Ebright Creek is one of the four primary spawning streams for Lake Sammamish kokanee. The stream is smaller than Laughing Jacobs and Lewis creeks but in recent years has often had more spawners than one or both of these other streams. Among all Lake Sammamish tributaries, the highest kokanee escapement has been in Ebright Creek for three out of the past five brood years (2009-10 to 2013-14). During the past 18 brood years, the peak kokanee escapement was 6,694 (7-day stream-life estimate) in 2012-13.

In July 2012, a critically important passage and restoration project was completed on Ebright Creek by a private land owner, Wally Pereyra. The project site is located several hundred feet upstream of East Lake Sammamish Parkway. The project involved the replacement of an undersized and perched culvert, which blocked fish passage under most conditions and impeded natural sediment transport, with a new bottomless concrete arch. In the fall of 2012, all returning kokanee could more easily migrate past this site to the upstream spawning reaches than they had been able to in decades with the old culvert. Additionally, work was initiated in the fall of 2012 to enhance and restore spawning habitat within the middle reach of Ebright Creek (Project 4) just downstream of the culvert project. This initial work included removal of invasive non-native vegetation along riparian areas and replanting with native trees and shrubs. Additional work in this reach may include placement of large wood or other pool forming structures.



### Projects Associated with Ebright Creek

*(in order from the creek mouth to the most upstream; potential timelines are given in Table 2)*

#### 1 Lower Reach Stream

**Enhancement** – Reducing the amount of bank armoring/hardening and sloping back banks to reduce the velocity of flows in the lower reaches of the creek below the parkway will increase the amount of viable spawning area in lower Ebright Creek and potentially increase the number of kokanee produced during each spawning season.

- Estimated Project Cost (planning & design) in 2012 dollars. \$25,000
- Estimated Project Cost (construction) in 2012 dollars. \$125,000
- Funds Acquired:
- Funds Needed: \$150,000
- Estimated Project Duration (planning & design):
- Estimated Project Duration (construction):
- Current or Potential Project Lead:

#### 2 Lower Reach Habitat

**Protection** – The lower reach stream enhancement in Ebright Creek could be more fully realized with the acquisition of adjacent properties from willing sellers. The acquisition of stream-adjacent properties would allow for greater enhancement and/or restoration and protection of this critical reach for kokanee migration upstream

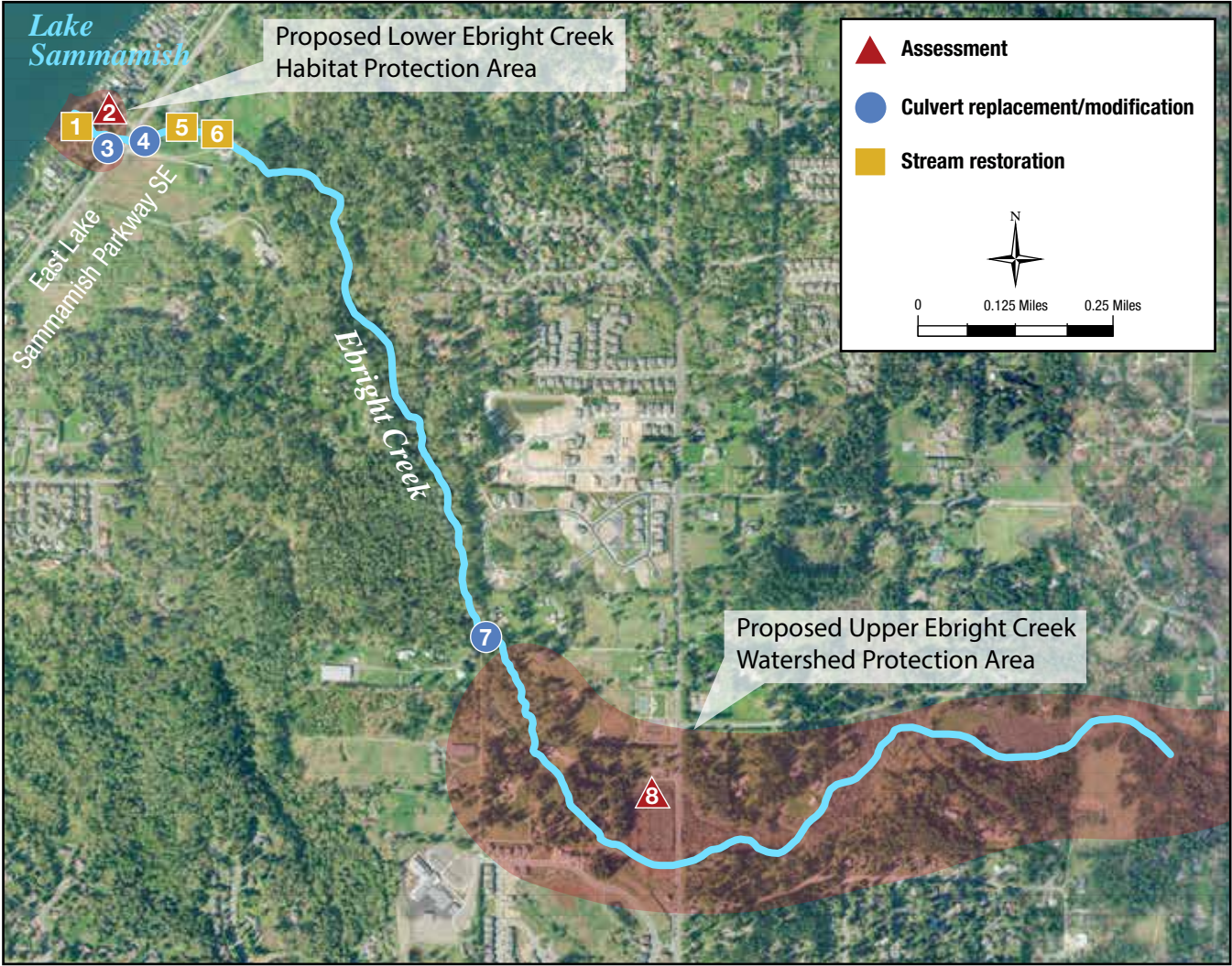


Figure 4. Locations of identified restoration/enhancement projects on Ebricht Creek.

| Ebricht   |              | ▲ Assessment                                       | ● Culvert replacement/modification | ■ Stream restoration   |
|-----------|--------------|--|------------------------------------|--|
| Project # | Project Type | Name of Project                                    |                                    | Description  |
| 1         | ■            | Lower Reach Stream Enhancement                     |                                    | Reduce bank armoring and flow velocity between parkway and lake.   |
| 2         | ▲            | Lower Reach Habitat Protection                     |                                    | Allow expansion of lower reach stream enhancements and increase long-term protection of kokanee habitat. |
| 3         | ●            | Culvert Replacement at East Lake Sammamish Trail   |                                    | Replace culvert to improve fish passage and sediment transport.  |
| 4         | ●            | Culvert Replacement at East Lake Sammamish Parkway |                                    | Replace culvert to improve fish passage and sediment transport.  |
| 5         | ■            | Middle Reach Restoration                           |                                    | Enhance and restore spawning habitat upstream of parkway.  |
| 6         | ■            | Driveway Bridge Replacement                        |                                    | Repair or replace driveway bridge to ensure adequate fish passage and sediment and wood transport.       |
| 7         | ●            | Culvert Replacement at 12th Street                 |                                    | Replace culvert to modulate stream flow/velocity.  |
| 8         | ▲            | Upper Reach Habitat Protection                     |                                    | Protect spawning habitat and prevent or minimize direct impacts to kokanee eggs.                         |

Table 1. List of eight proposed projects to restore or enhance kokanee fish passage and spawning habitat on Ebricht Creek. Project numbers indicate relative location on the stream (downstream to up-stream) and do not indicate priority or schedule of implementation.

to the upper watershed. The KWG will need to work with the landowner to evaluate opportunities and willingness to sell (recognizing that the acquisition could be an easement or fee interest).

- Estimated Project Cost (acquisition) in 2012 dollars. \$1,000,000
- Funds Acquired:
- Funds Needed: \$1,000,000
- Estimated Project Duration:
- Current or Potential Project Lead:

**3 Culvert Replacement at East Lake Sammamish Trail** – The culvert under East Lake Sammamish Trail obstructs natural sediment transport and may impede kokanee under some flow conditions from accessing upstream spawning grounds. Replacing this culvert, as well as the culvert in project 4 and the bridge in project 6, will restore more natural sediment transport and channel formation. Depending on the replacement design, additional spawning habitat could also be restored within the footprint of this crossing. The project site is approximately 200 ft upstream from the mouth of the creek and 50 ft downstream of project 4 (parkway culvert).

- Estimated Project Cost (planning & design): \$30,000 (50% design) + \$10,000 (90% design) + \$5,000 (final)
- Estimated Project Cost (construction): \$90,000

- Funds Acquired:
- Funds Needed:
- Estimated Project Duration (planning & design):
- Estimated Project Duration (construction):
- Current or Potential Project Lead: King County DNRP

**4 Culvert Replacement at East Lake Sammamish Parkway** – The culvert under East Lake Sammamish Parkway obstructs natural sediment transport and may impede kokanee under some flow conditions from accessing upstream spawning grounds. Replacing the culvert, as well as the culvert in project 3 and bridge in project 6, will restore more natural sediment transport and channel formation. Depending on the replacement design, additional spawning habitat could also be included within the footprint of this crossing. The project site is approximately 250 ft upstream from the mouth of the creek.

- Estimated Project Cost (planning & design):
- Estimated Project Cost (construction):
- Funds Acquired:
- Funds Needed:
- Estimated Project Duration (planning & design):
- Estimated Project Duration (construction):
- Current or Potential Project Lead: City of Sammamish

**5 Middle Reach Restoration** – Restoration of the middle reach of Ebright Creek will improve spawning habitat currently available to kokanee. This reach extends from the parkway culvert upstream to the driveway bridge on the Pereyra property.

- Estimated Project Cost (planning & design):
- Estimated Project Cost (construction):
- Funds Acquired:
- Funds Needed:
- Estimated Project Duration (planning & design):
- Estimated Project Duration (construction):
- Current or Potential Project Lead: City of Sammamish

**6 Driveway Bridge Replacement** – The driveway bridge on the Pereyra property is reaching the end of its lifespan. Repairing/replacing this bridge will ensure upstream fish passage is maintained through this reach, create spawning habitat under the footprint of the new bridge, as well as restore more natural sediment and wood transport and channel formation.

- Estimated Project Cost (planning & design): \$15,000
- Estimated Project Cost (construction): \$75,000
- Funds Acquired:
- Funds Needed: \$100,000
- Estimated Project Duration (planning & design):
- Estimated Project Duration (construction):

- Current or Potential Project Lead: City of Sammamish and landowner

**7 Culvert Replacement at 12th Street** – Replacing the 12th Street culvert, which influences the flows within downstream spawning reaches of the creek, will reduce the chances of scouring events wiping out the redds/alevins in downstream reaches. The culvert is located just downstream of Ebright Creek Park.

- Estimated Project Cost (planning & design):
- Estimated Project Cost (construction):
- Funds Acquired:
- Funds Needed:
- Estimated Project Duration (planning & design):
- Estimated Project Duration (construction):
- Current or Potential Project Lead: City of Sammamish

**▲ Upper Reach Habitat Protection** – The upper reach of Ebright Creek, and consequently all downstream habitat, is susceptible to developmental impacts. Protection of intact habitats, preventing or minimizing bank stabilization and upslope impacts, and ensuring stream water quality is maintained or improved are key to supporting continued use of the watershed by kokanee. Land acquisition, purchase of development rights, and conservation easements are possible approaches that could be used to achieve this action.

- Estimated Project Cost (planning & design):
- Estimated Project Cost (easements/acquisitions):
- Funds Acquired:
- Funds Needed:
- Estimated Project Duration (planning & design):

- Estimated Project Duration (easements/acquisitions):
- Current or Potential Project Lead:

Zaccuse, Ebright, Pine Lake (ZEP)

Team Members:

Don Gerend, Tom Odell, Eric Lafrance (City of Sammamish); Wally Pereyra (private landowner); Matt Baerwalde (Snoqualmie Tribe); Jeff Chan, Brad Thompson, Paul Bakke (USFWS); Erica Tiliacos (Save Lake Sammamish); Ilene Stahl (Friends of Pine Lake); and Mark Taylor (Trout Unlimited)

## Reference

King County. 2013. Kokanee and Chinook restoration projects, Sammamish Watershed. <http://www.kingcounty.gov/environment/animalsAndPlants/restoration-projects/kokanee-chinook-projects.aspx>

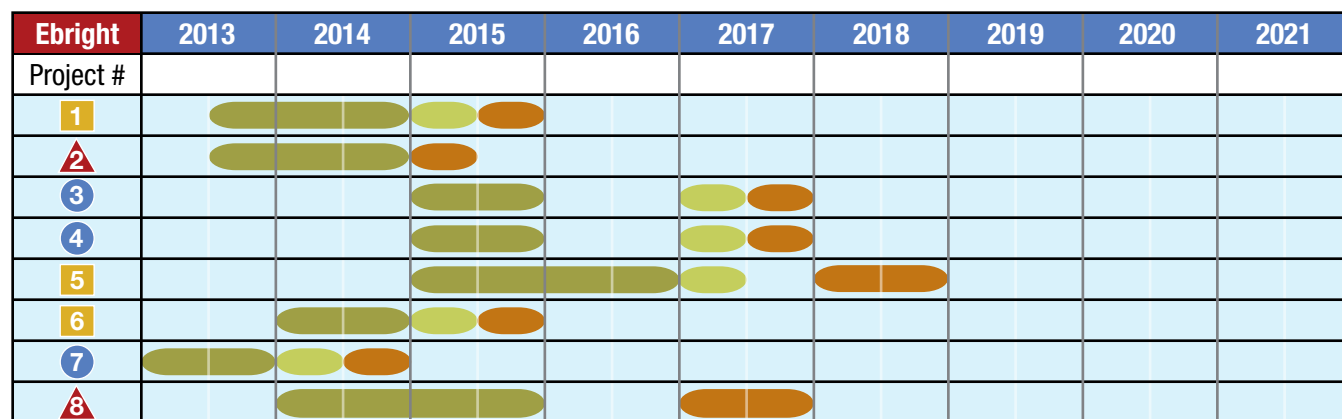


Table 2. Potential timeline for kokanee restoration/enhancement projects in Ebright Creek. Projects are listed in order from the creek mouth to the most upstream and scheduling is independent for each project.



## Laughing Jacobs Creek

### Goal/Vision

The goal for Laughing Jacobs Creek is to protect and enhance the self-sustaining kokanee population in this creek. Projects will stabilize and improve habitat conditions in the spawning area and directly enhance the kokanee population through supplementation. As recovery actions are implemented, we expect 500 to 1,000 adults will use Laughing Jacobs Creek each year.

Laughing Jacobs Creek (WRIA #08.0166) enters the lake on its southeastern shore, on the northern edge of Lake Sammamish State Park near the boat launch (Figure 5). The lower part of the stream is in the City of Issaquah, while the upper part (above the canyon) is in the City of Sammamish. The lowest approximately 800 feet of the stream are on private property. Immediately upstream, the stream goes under the East Lake Sammamish Trail and East Lake Sammamish Parkway. The twin culverts—one for Laughing Jacobs Creek and the other for the adjacent but much smaller Many Springs Creek—under East Lake Sammamish Parkway are currently not fish barriers. The Laughing Jacobs Creek culvert was constructed in 1988 when the parkway was widened and the creek moved from a much longer culvert that ran diagonally under the old two-lane road. The next 0.8 miles of stream length are in Lake Sammamish State Park (Hans Jensen Group Area). Upstream of this reach, fish passage is blocked by natural falls (William et al. 1975). The upper watershed is largely built out with residential home developments. This area also contains wetlands and Laughing Jacobs Lake, which appear to attenuate high-flow events.

Laughing Jacobs Creek is one of the four primary spawning streams for Lake Sammamish kokanee (Figure 6). In most brood years, the spawning numbers have been lower in Laughing Jacobs Creek than in Lewis or Ebright creeks but higher than in Pine Lake Creek. Over the past 18 brood years, the escapement has ranged from 0 in 1998-99 to 1,384 fish (7-day stream-life estimate) in 2012-13. The main spawning area for kokanee in Laughing Jacobs Creek is upstream of the East Lake Sammamish Parkway in the Hans Jensen Group Area.

The exact list of restoration projects for Laughing Jacobs Creek depends on whether the stream channel is rerouted (Table 3). This large restoration project would involve rerouting the stream in the Hans Jensen Group Area to the south and the stream would enter the lake to the southwest of the boat ramp area. A new culvert would have to be built under East Lake Sammamish Trail and East Lake Sammamish Parkway. If completed, the lower part of the stream would be completely in state park lands and there would be ample room to construct an improved stream channel. Preliminary analysis indicates there are no significant issues with constructing



a new box culvert under the parkway and trail, other than the high cost. Channel gradient upstream of the parkway would be about 4%. However, below the parkway it would be less than 1% because the box culvert would need to be placed about 9 feet below the road surface to avoid the many utilities within the right-of-way, reducing the slope in the lower reach. This may result in less than optimum spawning habitat due to finer sediment deposition.

Additional information on Laughing Jacobs Creek and its restoration projects can be found in the following reports: City of Issaquah (2011), King County (2013), and The Watershed Company (2005, 2006).



Figure 5. Locations of identified restoration/enhancement projects on Laughing Jacobs Creek.



Figure 6. The kokanee spawning reach of Laughing Jacobs Creek in Lake Sammamish State Park (Hans Jensen Group Area), November 2011 (photo credit: Roger Tabor, USFWS).

| Laughing Jacobs |              | ▲ Assessment                    | ■ Stream restoration  |
|-----------------|--------------|---------------------------------|---|
| Project #       | Project Type | Name of Project                 | Description   |
| 1               | ▲            | Assessment of Reroute Option    | Evaluate feasibility of rerouting stream.   |
| 2               | ■            | Lower Reach Restoration         | Reroute channel or enhance current channel to improve spawning.                               |
| 3               | ▲            | Assessment of Parkway Culvert   | Evaluate hydraulics and fish passage of culvert under parkway.                                |
| 4               | ■            | Restoration in Hans Jensen Park | Enhance stream channel by installing pool-forming structures and addition of spawning gravel. |

Table 3. List of four proposed projects to aid in the restoration or enhancement of kokanee spawning habitat on Laughing Jacobs Creek. Project numbers indicate relative location on the stream (down-stream to upstream) and do not indicate priority or schedule of implementation.

## Projects Associated with Laughing Jacobs Creek

(in order from the creek mouth to the most upstream; potential timelines are given in Table 4)

### **1 Assessment of Reroute Option**

– Evaluate feasibility of rerouting stream to go south of boat ramp so lower reach will be completely on state parks lands, creating about 1,600 feet of new channel.

- Estimated Project Cost:
- Funds Acquired: \$0
- Funds Needed:
- Estimated Project Duration:
- Current or Potential Project Lead:

### **2 Lower Reach (Downstream of Parkway) Restoration**

– There are two possibilities to restore the lower reach: 1) channel rerouted to go south of boat ramp and lower reach will be completely on state parks lands, creating about 1,600 feet of new channel, or 2) enhance current lower section to improve pool-forming features and improve riparian vegetation. The first option would also include building a new culvert system for the parkway and trail. Landowner support for either option is unknown at this time.

#### **A. Reroute option**

- Estimated Project Cost: \$1 million or more
- Funds Acquired: \$0
- Estimated Project Duration (planning & design): not scheduled

- Estimated Project Duration (construction): not scheduled
- Current or Potential Project Lead: City of Issaquah

#### **B. Restoration of existing channel option**

- Estimated Project Cost: \$200,000
- Funds Acquired: \$0
- Funds Needed: \$200,000
- Estimated Project Duration (planning & design): 36 months
- Estimated Project Duration (construction): 36 months
- Current or Potential Project Lead: City of Issaquah

### **3 East Lake Sammamish Parkway Culvert Assessment**

– Evaluate hydraulics and fish passage of the current culverts under East Lake Sammamish Parkway and recommend options. Evaluation of this project would be done as part of 1 above.

- Estimated Project Cost: \$15,000
- Funds Acquired: \$0
- Funds Needed: \$15,000
- Estimated Project Duration (planning & design):
- Estimated Project Duration: Next year
- Current or Potential Project Lead: City of Issaquah

### **4 Stream Restoration in Hans Jensen Park**

Enhance existing stream channel by installing pool-forming structures, bank softening measures, and additional spawning gravel. The scope of this project will depend if the reroute project is undertaken. If the reroute project is undertaken, this project would start at the small bridge and extend upstream about 1,000 feet. If the reroute project is not undertaken, then this project will start at the parkway and extend upstream to the same end point. This project will also include removal of bank armoring between the park residence and the parkway, if the reroute is not undertaken.

#### **A. Reroute option -**

Restoration of existing channel downstream to start of reroute channel (project would be included in 2A, above)

#### **B. Without Reroute option - Restoration of existing channel downstream to parkway**

- Estimated Project Cost: \$350,000
- Funds Acquired: \$0
- Funds Needed: \$350,000
- Estimated Project Duration (planning & design): 36 months
- Estimated Project Duration (construction): six months
- Current or Potential Project Lead: City of Issaquah

| Laughing<br>Jacobs | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|--------------------|------|------|------|------|------|------|------|------|------|
| Project #          |      |      |      |      |      |      |      |      |      |
| 1                  |      |      |      |      |      |      |      |      |      |
| 2A (TBD)           |      |      |      |      |      |      |      |      |      |
| 2B                 |      |      |      |      |      |      |      |      |      |
| 3                  |      |      |      |      |      |      |      |      |      |
| 4A                 |      |      |      |      |      |      |      |      |      |
| 4B                 |      |      |      |      |      |      |      |      |      |

Table 4.— Potential timeline for kokanee restoration projects in Laughing Jacobs Creek. Projects are listed in order from the creek mouth to the most upstream and scheduling is independent for each project.



## Laughing Jacobs Team Members:

Kerry Ritland (City of Issaquah); Roger Tabor, Jeff Chan, Brad Thompson (USFWS); and Hans Berge (King County)

## References

City of Issaquah. 2011. State of our waters, fourth report. Issaquah Aquatic Resources Monitoring Report 1999–2010. Public Works Engineering Department and Resource Conservation Office, Issaquah, Washington.

King County. 2013. Kokanee and Chinook restoration projects, Sammamish Watershed. <http://www.kingcounty.gov/environment/animalsAndPlants/restoration-projects/kokanee-chinook-projects.aspx>

The Watershed Company.

2005. Lake Sammamish State Park wetland, stream and lakeshore restoration plan. Report of the Watershed Company to the Washington State Parks & Recreation Commission.

The Watershed Company.

2006. Stream and riparian areas restoration plan. Report of the Watershed Company to the City of Issaquah, Washington.

Williams, R. W., R. M. Laramie, and J. J. Ames. 1975. A catalog of Washington streams and salmon utilization, volume 1, Puget Sound Region. Washington Department of Fisheries, Olympia.

## Lewis Creek

### Goal/Vision

It is our (KWG) intention that by implementing the following projects we will assist the recovery of the self-sustaining kokanee population in Lewis Creek to previously observed numbers of spawners. Projects will stabilize and improve habitat conditions in the spawning area, stabilize natural processes throughout the system, and directly enhance the kokanee population through supplementation. As some of the recovery efforts are being implemented, we expect Lewis Creek to support at least 500 adults each year. Once all these measures have been implemented, we expect that the system will be able to support over 1,000 spawners each year. Additionally, we expect the egg-to-fry survival rate to increase from a range of 4–12% at present to 10–20%.

Lewis Creek (WRIA #08.0162) is located in the southwest part of the Lake Sammamish basin in an area known as Greenwood Point. The lower part of the stream (north of I-90/West Lake Sammamish Parkway) is in the City of Issaquah, while the upper part is primarily in the City of Bellevue (Figure 7). Over the last few decades this stream has seen a large increase in urban development. Kokanee spawn in the lower 4,125 feet of the creek up to West Lake Sammamish Parkway. Land use along this stream reach is all low density residential development and the stream bed and

riparian area is owned by over 30 separate landowners. The residential development has constrained the floodplain and reduced natural processes. Upstream of this is one large major culvert under I-90 and West Lake Sammamish Parkway that completely stops upstream fish passage. Upstream of the culvert there is a limited amount of potential kokanee spawning habitat within the steep, unstable ravine. Even with extensive riparian parklands, this ravine is prone to large erosion and landslide events. Because there is not extensive spawning habitat above the culvert and fixing the culvert would be a large, expensive project, the KWG does not consider this a feasible recovery project in the next 15 years.

Lewis Creek is one of the four primary spawning streams for Lake Sammamish kokanee. From brood year 1996-97 to 2008-09, kokanee escapement was highest in Lewis Creek 10 out of 13 years. However in the past five brood years, the highest kokanee escapement has been in either Ebright or Laughing Jacobs creeks. During the past 18 brood years, the peak kokanee escapement was 6,495 (7-day stream-life estimate) in 2012-13.

Completed restoration projects in Lewis Creek include a fish passage project completed by the City of Issaquah in July 2008. The project site is located just downstream of SE 44th Street, about midway between the lake and I-90. The project involved the construction of five rock



weirs in the channel below the passage barrier to create a series of steps that fish can successfully navigate (the old barrier was about 2 feet high). This now allows kokanee to access habitat upstream of West Lake Sammamish Parkway during all flow conditions.

A major restoration project is currently planned for Lewis Creek (Table 5) which involves the installation of a series of instream grade-control structures to make the channel bed more resistant to high flows and also to capture fine sediments, thus improving kokanee spawning habitat. Accumulated sediment near the mouth would also be removed. Background information on this large project can be found in a report by Northwest Hydraulics Consultants (2011).

Additional information on Lewis Creek can be found in a report prepared by King County (2013) and The Watershed Company (2006).



Figure 7. Locations of identified restoration/enhancement projects on Lewis Creek.

| Lewis     |              | ▲ Assessment                        | ● Culvert replacement/modification | ■ Stream restoration   |
|-----------|--------------|-------------------------------------|------------------------------------|--|
| Project # | Project Type | Name of Project                     |                                    | Description  |
| 1         | ■            | Lower Spawning Reach Restoration    |                                    | Install series of instream grade-control structures.                         |
| 2         | ■            | Upper Spawning Reach Restoration    |                                    | Install series of instream grade-control structures.                         |
| 3         | ▲            | Protection of Riparian Corridor     |                                    | Develop landowner stewardship project to help protect the riparian corridor. |
| 4         | ●            | Trash Rack at I-90 Culvert          |                                    | Replace or modify existing trash rack.                                       |
| 5         | ▲            | Upper Basin Hydrological Assessment |                                    | Assess upper basin to improve stormwater management.                         |

*Table 5. List of five proposed projects to aid in the restoration or enhancement of kokanee spawning habitat on Lewis Creek. Project numbers indicate relative location on the stream (downstream to up-stream) and do not indicate priority or schedule of implementation.*

## Projects Associated with Lewis Creek

(in order from the creek mouth to the most upstream; potential timelines are given in Table 6)

- 1 Lower Spawning Reach (1,740 feet of stream; Reach 3 and 4)** – Phase 1 – City of Issaquah proposes to install a series of instream grade-control structures to capture fine sediments along with sediment removal near the mouth to improve kokanee spawning habitat (Northwest Hydraulics Consultants 2011). This project has landowner support.

- Estimated Project Cost: \$325,000
- Funds Acquired: \$125,000 (City of Issaquah)
- Funds Needed: \$200,000
- Estimated Project Duration (planning & design): six months
- Estimated Project Duration (construction): 18 months
- Current or Potential Project Lead: City of Issaquah

## **2 Upstream Spawning Reach (2,385 feet of stream; Reach 1 and 2)**

– Phase 2 – This is a continuation of Project #1 except this project will enhance the kokanee spawning area immediately upstream of Project #1 to the West Lake Sammamish Parkway. Another series of instream grade-control structures will be installed to capture fine sediments and thus improve kokanee spawning habitat. No project planning or landowner contacts have been made on this project.

- Estimated Project Cost: \$400,000
- Funds Acquired: \$0
- Funds Needed: \$400,000
- Estimated Project Duration (planning & design): One year
- Estimated Project Duration (construction): One year
- Current or Potential Project Lead: City of Issaquah

## **3 Protect Riparian Corridor of Spawning Reach**

– Further development of a landowner stewardship project to help protect the riparian corridor of the spawning reach (creek mouth to West Lake Sammamish Parkway). Ongoing partnership with the Meadowbrook Point Homeowners Association (encompasses the lower half of the spawning reach) will help protect much of the riparian corridor. Developing partnerships with landowners in the upper spawning reach is needed.

- Estimated Project Cost: No cost
- Estimated Project Duration (planning & design): None
- Estimated Project Duration: next seven years
- Current or Potential Project Lead: City of Issaquah

## **4 Trash Rack at I-90 Culvert**

– The current trash rack upstream of the I-90 culvert

occasionally becomes plugged with debris during a high-flow event. Once debris is removed by WSDOT maintenance crews, a high discharge event can occur and cause scour to kokanee redds. The last major event was in 2007. Further discussions with WSDOT are needed to move this project forward.

- Estimated Project Cost: \$100,000
- Funds Acquired: \$0
- Funds Needed: \$100,000
- Estimated Project Duration (planning & design): One year
- Estimated Project Duration (construction): One year
- Current or Potential Project Lead: WSDOT

**▲ Upper Basin Hydrological Assessment** – An assessment of the upper basin will provide

recommendations on the best methods to manage stormwater and maintain and stabilize natural processes.

- Estimated Project Cost: \$100,000
- Funds Acquired: \$0
- Funds Needed: \$100,000
- Estimated Project Duration (planning & design): Six months
- Estimated Project Duration (construction): Two years
- Current or Potential Project Lead: City of Bellevue

### Lewis and Vasa Team Members:

Kerry Ritland (City of Issaquah); Kit Paulsen, Glenn Kost (City of Bellevue); Kirk Lakey (WDFW); Roger Tabor, Brad Thompson (USFWS); and Hans Berge (King County)

### References

King County. 2013. Kokanee and Chinook restoration projects, Sammamish Watershed. <http://www.kingcounty.gov/environment/animalsAndPlants/restoration-projects/kokanee-chinook-projects.aspx>

Northwest Hydraulics Consultants. 2011. Lewis Creek grade control engineering study, phase 1 stream characterization, draft report, Issaquah project no.G00511. Report of Northwest Hydraulics Consultants to the City of Issaquah, Washington.

The Watershed Company. 2006. Stream and riparian areas restoration plan. Report of the Watershed Company to the City of Issaquah, Washington.

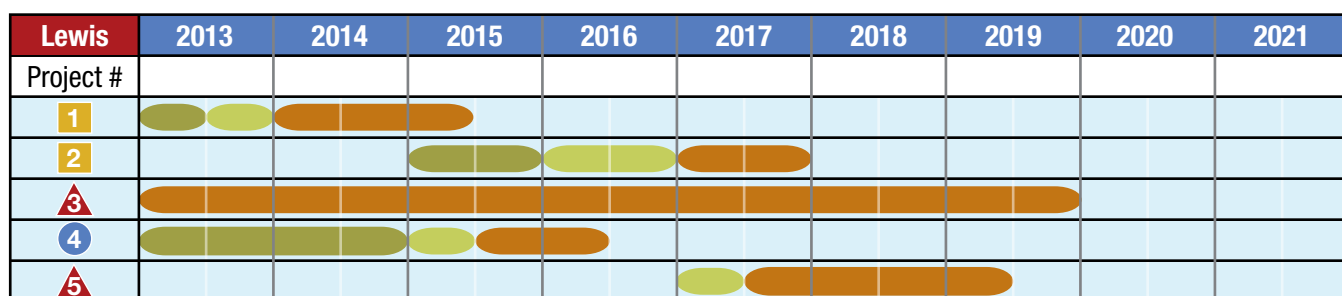


Table 6. Potential timeline for kokanee restoration projects in Lewis Creek. Projects are listed in order from the creek mouth to the most upstream and scheduling is independent for each project.



## Pine Lake Creek

### Goal/Vision

It is our (KWG) intention that by implementing the following projects we will not only greatly expand our knowledge of Pine Lake Creek, we will also be able to supplement kokanee into the system and help establish a self-sustaining spawning aggregation.

Pine Lake Creek (WRIA #08.0152) is on the east side of Lake Sammamish and is located about 500 ft south of 8th Street off of the East Lake Sammamish Parkway in Sammamish (Figure 8). Pine Lake Creek has three known culverts that may impede fish passage, but a major habitat assessment of the creek is necessary to determine the creek's current and potential capacity to support kokanee (Table 7). The three culverts are the East Lake Sammamish Shore Lane SE pipe culvert, the East Lake Sammamish Trail culvert, and the East Lake Sammamish Parkway box culvert.

Pine Lake Creek is one of the four primary spawning streams for Lake Sammamish kokanee, although it generally has substantially fewer spawners than each of the other three creeks. Historically, kokanee returned to spawn in Pine Lake Creek in significant numbers. However, over the last few

years that this creek has been monitored, fewer than 10 kokanee returned to spawn in 11 of 18 years. During the 2012-13 spawning season, an estimated 485 kokanee returned (7-day stream-life estimate), thus indicating this creek may be capable of supporting a good run of kokanee.





Figure 8. Locations of identified restoration/enhancement projects on Pine Lake Creek.

| Pine Lake |              | ▲ Assessment   | ● Culvert replacement/modification | ■ Stream restoration                                       | ● Supplementation/reintroduction |
|-----------|--------------|--|------------------------------------|--|----------------------------------|
| Project # | Project Type | Name of Project  |                                    | Description  |                                  |
| 1         | ▲            | Pine Lake Creek Basin Assessment/Plan                                |                                    | Assess watershed to identify limiting factors for kokanee. |                                  |
| 2         | ■            | Reach Restoration Downstream of Parkway                              |                                    | Restore or enhance kokanee staging and spawning habitat.   |                                  |
| 3         | ●            | Culvert Replacement/Improvement at East Lake Sammamish Shore Lane SE |                                    | Replace or modify culvert to improve fish passage.         |                                  |
| 4         | ●            | Culvert Replacement/Improvement at East Lake Sammamish Trail         |                                    | Replace or modify culvert to improve fish passage.         |                                  |
| 5         | ■            | Reach Restoration Upstream of Parkway                                |                                    | Restore or enhance kokanee spawning habitat.               |                                  |
| 6         | ●            | Pine Lake Creek Reintroduction                                       |                                    | Supplement or reintroduce kokanee into this creek system.  |                                  |

*Table 7. List of the seven proposed major projects for kokanee fish passage and spawning habitat enhancement on Pine Lake Creek. Project numbers indicate relative location on the stream (downstream to upstream) and do not indicate priority or schedule of implementation.*

## Projects Associated with Pine Lake Creek

(in order from the creek mouth to the most upstream; potential timelines are given in Table 8)

**▲ Pine Lake Creek Basin Assessment/Plan** – The Pine Lake Creek Basin Plan will assess the basin as a whole, and in doing so will identify problems which occur in the basin that could directly affect the long-term survival of kokanee. The City of Sammamish will lead the completion of the Pine Lake Creek Basin Plan.

- Estimated Project Cost: \$300,000
- Funds Acquired:
- Funds Needed:
- Estimated Project Duration:
- Current or Potential Project Lead: City of Sammamish

**2 Reach Restoration Downstream of Parkway** – The reaches of Pine Lake Creek downstream of the parkway historically

supported spawning kokanee. Although some restoration improvements have been implemented in this reach, placement of additional wood and additional riparian planting in parts of this reach would increase instream cover, control bedload movement, and provide additional holding pools.

- Estimated Project Cost (planning & design): \$10,000
- Estimated Project Cost (construction): \$65,000
- Funds Acquired:
- Funds Needed: \$75,000
- Estimated Project Duration (planning & design):
- Estimated Project Duration (construction):
- Current or Potential Project Lead:

**3 Culvert Replacement/Improvement at E. Lake Sammamish Shore Lane** – The culvert under East Lake Sammamish Shore Lane SE may impede

kokanee from accessing upstream spawning grounds in some instances (Figure 9). Modification of the culvert, as well as the culverts in project 4, will allow kokanee to more freely access the upper reaches of the creek. The project site is approximately 200 ft upstream from the mouth of the creek and 100 ft downstream of the East Lake Sammamish Trail culvert.

- Estimated Project Cost (planning & design): \$25,000
- Estimated Project Cost (construction): \$150,000
- Funds Acquired:
- Funds Needed: \$175,000
- Estimated Project Duration (planning & design):
- Estimated Project Duration (construction):
- Current or Potential Project Lead: City of Sammamish

**4 Culvert Replacement/Improvement at East Lake Sammamish Trail** – The culvert under East

Lake Sammamish Trail may impede kokanee from accessing upstream spawning grounds during some flows (Figure 9). Replacement or modification of the culvert, as well as the culvert in project 3, will allow kokanee to more freely access the upper reaches of the creek. Depending on the replacement/modification design, additional spawning habitat could also be restored within the footprint of this crossing. The project site is approximately 200 ft upstream from the mouth of the creek and 100 ft downstream of the East Lake Sammamish Parkway box culvert.

- Estimated Project Cost (planning & design): \$30,000 (50% design) + \$10,000 (90% design) + \$5,000 (final)
- Estimated Project Cost (construction): \$90,000
- Funds Acquired:
- Funds Needed:
- Estimated Project Duration (planning & design):
- Estimated Project Duration (construction):
- Current or Potential Project Lead: King County DNRP

##### 5 Reach Restoration Upstream of Parkway –

The reaches of Pine Lake Creek upstream of the parkway historically supported spawning kokanee. Improving instream and riparian habitat in this reach is targeted to maintain and increase this use. Removing man-made

armoring along portions of the stream bank and bed, increasing riparian planting, and creating pool-forming structures will enhance the successful spawning and incubation of kokanee in this creek.

- Estimated Project Cost (planning & design):
- Estimated Project Cost (construction):
- Funds Acquired:
- Funds Needed:
- Estimated Project Duration (planning & design):
- Estimated Project Duration (construction):
- Current or Potential Project Lead:

##### 6 Pine Lake Creek Reintroduction –

Supplementation or reintroduction of kokanee into Pine Lake Creek using the supplementation program is the most efficient way of increasing abundance of or re-establishing the spawning run of kokanee within this stream. The Issaquah Creek Hatchery will oversee egg incubation and fry rearing for this effort. Cost will vary depending upon availability of recirculating RSI units at the hatchery and any necessary infrastructure upgrades.

- Estimated Project Cost (planning & design): \$36,000 (construction of additional RSI incubator system)
- Estimated Project Cost (implementation): \$18,000/year (operation & maintenance)

- Funds Acquired: None
- Funds Needed: \$36,000 + \$72,000 (four years of operation & maintenance for one kokanee generation) + \$144,000 (eight additional years of operation & maintenance for two additional kokanee generations)
- Estimated Project Duration (planning & design): 45 days
- Estimated Project Duration (implementation): Up to 12 years (may be less, subject to population response)
- Current or Potential Project Lead: WDFW, USFWS, and King County DNRP

##### Zaccuse, Ebright, Pine Lake (ZEP) Team Members:

Don Gerend, Tom Odell, Eric Lafrance (City of Sammamish); Wally Pereyra (private landowner); Matt Baerwalde (Snoqualmie Tribe); Jeff Chan, Brad Thompson, Paul Bakke (USFWS); Erica Tiliacos (Save Lake Sammamish); Ilene Stahl (Friends of Pine Lake); and Mark Taylor (Trout Unlimited)

| Pine Lake | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|-----------|------|------|------|------|------|------|------|------|------|
| Project # |      |      |      |      |      |      |      |      |      |
| 1         |      |      |      |      |      |      |      |      |      |
| 2         |      |      |      |      |      |      |      |      |      |
| 3         |      |      |      |      |      |      |      |      |      |
| 4         |      |      |      |      |      |      |      |      |      |
| 5         |      |      |      |      |      |      |      |      |      |
| 6         |      |      |      |      |      |      |      |      |      |

Table 8. Potential timeline for kokanee restoration projects in Pine Lake Creek. Projects are listed in order from the creek mouth to the most upstream and scheduling is independent for each project.

- ▲

Assessment
- Planning
- Culvert replacement/modification
- Permitting
- Stream restoration
- Implementation
- Supplementation/reintroduction



Figure 9. Two potential culvert replacement projects on Pine Lake Creek (photo credit: Rachel Brooks; December 16, 2013). The left photograph is the culvert under the East Lake Sammamish Trail and the right photograph is the culvert under East Lake Sammamish Shore Lane SE. Both photographs were taken looking upstream.